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Momentum Resolved Optical Lattice Modulation Spectroscopy for Bosons in Optical Lattice¹ RAJDEEP SEN-SARMA, Condensed Matter Theory Center, University of Maryland, College Park, KRISHNENDU SENGUPTA, Indian Association for cultivation of Science, Kolkata, Iindia, SANKAR DAS SARMA, Condensed Matter Theory Center, University of Maryland, College Park — We propose a new method of optical lattice modulation spectroscopy for studying the spectral function of ultracold bosons in an optical lattice. We show that different features of the single particle spectral function in different quantum phases can be obtained by measuring the change in momentum distribution after the modulation. In the Mott phase, this gives information about the momentum dependent gap to particle-hole excitations as well as their spectral weight. In the superfluid phase, one can obtain the spectrum of the gapless Bogoliubov quasiparticles as well as the gapped amolitude fluctuations. The distinct evolution of the response with modulation frequency in the two phases can be used to identify these phases and the quantum phase transition separating them.

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